

# **Long -term variation (2000-2010) of gross alpha, gross beta and gamma radionuclides in surface air: Analysis of their variation, prediction model and doses**

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During a 11 years period (2000-2010) we are continuously measuring the atmospheric radioactivity in the surroundings as part of a general project undertaken by many laboratories in Spain in collaboration with the Spanish authorities. In this paper gross alpha, gross beta and artificial and gamma emitting radionuclides are routinely measured in samples of airborne dust samples and our sampling site is geographically far from the influence of nuclear installations. The sampling site is one of the environmental radioactivity monitoring network stations operated by the Spanish Nuclear Security Council (CSN), under cooperative agreement with the University of Málaga through the Environmental Radioactivity Research group. The sampling point was located 12 m above the ground, on the roof of the Faculty of Sciences, University of Málaga. The site where the measurements were carried out (4° 28' 4" W; 36° 43' 40" N) is in the North-West of the city, 5 km away from the coastline. Málaga is the mayor coastal city of Andalusia region, South Spain. The Spanish city on the Mediterranean is distinguished by its mild, temperate and warm climate with low rainfall (550 mmyr<sup>-1</sup>) and around 320 days of sun a year. All detected gamma radionuclides are of natural origin. We analyze the time series of gross alpha, gross beta and gamma radionuclides composition of air. The data are sufficiently numerous to allow us to examine variation in time and through these measurements we have established several parameters that should be of importance in understanding any trends in radionuclide concentrations in the atmosphere. Seasonal variations of gross alpha, gross beta activities and radionuclides concentrations in the atmosphere show a tendency for a maximum in the spring and summer and a minimum in fall and winter. In this work, the concentrations and meteorological data have been made in order to determine a mathematical model for gross alpha, gross beta and gamma radionuclides. The model can be used to estimate that part of the trend in gross alpha, gross beta activities and gamma radionuclides that can be accounted for by trends in local meteorology. A satisfactory agreement

between the results of the model and the measurements was highlighted. Also we have estimated the doses due to radioactive aerosols at Málaga air.

***KEYWORDS: Atmospheric Aerosols; Gross alpha; Gross beta; Gamma Radionuclides; Prediction model; Effective dose.***